

WHAT IS CLAIMED IS:

1-36. (Canceled)

37. (New) A method of enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

 adding one or more predetermined crude protein and/or amino acid content nutrient sources into the wet end of distillation or fermentation byproducts after at least one of fermentation and/or distillation to create a distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutrient value;

 determining a by-product mixture nutrient level; and

 changing at least one of the bypass protein (RUP/UIP) level and the post ruminal digestibility of the by-product nutrient source mixture to achieve the determined by-product mixture nutrient level by changing the temperature of the by-product-nutrient source mixture.

38. (New) The method of claim 37, wherein temperature of the by-product mixture ranges from about 180°F to about 250°F.

39. (New) The method of claim 38, wherein the temperature of the by-product mixture is about 218°F.

40. (New) The method of claim 37, wherein at least two of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal

digestibility of the by-product nutrient source mixture are changed to predetermined levels by changing the temperature of the by-product-nutrient source mixture.

41. (New) The method of claim 37, wherein the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the by-product nutrient source mixture are changed to predetermined levels by changing the temperature of the by-product-nutrient source mixture.

42. (New) A method of producing an improved distillers, brewers or fermenters grain by-product, comprising:

establishing desirable nutritional values, including RUP/UIP levels and/or RUP/UIP amino acid levels for a nutritionally enhanced distillers, brewers or fermenters grain by-product;

determining nutrients and nutrient amounts to be added to the by-product to achieve one or more nutritionally enhanced distillers, brewers or fermenters grain by-products that have at least one of different RUP/UIP and different RUP/UIP amino acid levels, than the established desirable values thereof;

mixing determined amounts of one or more nutrients with wet distillers, brewers or fermenters grain; and

heating the mixture of wet distillers grains and nutrients to achieve a by-product temperature between from about 180°F to about 250°F to change at least one of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the mixture to achieve a mixture having the established desirable nutritional values.

43. (New) The method of claim 42, wherein the predetermined nutrient amounts are mixed with wet distillers, wet brewers or wet fermenters grain in an off-line mixer.

44. (New) The method of claim 42, wherein the predetermined nutrient amounts are premixed prior to being mixed with the wet distillers, wet brewers or wet fermenters grain.

45. (New) The method of claim 42, wherein the premixed nutrient amounts are added to the wet distillers, wet brewers or wet fermenters grain prior to drying.

46. (New) The method of claim 42, wherein the predetermined nutrient amounts are added to the wet distillers, wet brewers or wet fermenters grains both before being dried and while being dried.

47. (New) The method of claim 42, further comprising cooling the mixture to reach a temperature below about 200°F.

48. (New) The method of claim 42, further including extruding the mixture.

49. (New) The method of claim 48, further including applying heat to the mixture while extruding the mixture.

50. (New) The method of claim 42, wherein at least two of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the mixture are changed.

51. (New) The method of claim 42, wherein desirable nutritional values are established for crude protein, total amino acids, fat fiber, minerals, a ruminant animal bypass protein (RUP/UIP) range, amino acids in the RUP/UIP, and post ruminal digestibility of the RUP/UIP.

52. (New) A system for enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

an injector to inject one or more predetermined crude protein and/or amino acid content nutrient sources into the wet end of distillers, brewers or fermenters grain distillation or fermentation byproduct creating process after at least one of a fermentation process and a distillation process to create an enhanced by-product-nutrient source mixture; and

a heater to raise the temperature of, and dry, the by-product-nutrient source mixture to change the ruminant animal bypass protein of the by-product nutrient source mixture to one or more predetermined levels.

53. (New) The system of claim 52, wherein the heater applies heat to achieve a by-product temperature in a range of from about 180°F to about 250°F.

54. (New) The system of claim 52, wherein the temperature is about 218°F.

55. (New) A system to produce an improved distillers, brewers or fermenters grain by-product, comprising:

 a system element to establish target nutritional values for a nutritionally enhanced distillers grain by-product;

 a system element to determine one or more nutrients and nutrient amounts to be added to the distillers, brewers or fermenters by-product that has a different RUP/UIP to achieve nutritionally enhanced distillers, brewers, or fermenters grain by-product that will meet the established target nutritional values after processing.

 a system element to mix the determined amounts of one or more nutrients with wet distillers, brewers or fermenters grains to achieve a nutritionally enhanced by-product mixture with nutrient values different than the established target nutritional values; and

 a system element to heat and dry the mixture of wet distillers, brewers or fermenters grains and nutrients to achieve a by-product temperature between from about 180°F to about 250°F to change at least one

of the bypass protein (RUP/UIP) level, and the post ruminal digestibility of the by-product nutrient source mixture to the predetermined nutrient level to achieve a mixture having the established target nutritional values.

56. (New) The system of claim 55, further comprising
a system element to mix the predetermined nutrient amounts with wet distillers, brewers or fermenters grains off-line.

57. (New) The system of claim 55, wherein the predetermined nutrient amounts are premixed prior to being mixed with the wet distillers, brewers or fermenters grains.

58. (New) The system of claim 57, wherein the premixed nutrient amounts are added to the wet distillers, brewers or fermenters grains prior to drying.

59. (New) The system of claim 57, wherein the predetermined nutrient amounts are added to the wet distillers, brewers or fermenters grains both before being dried and while being dried.

60. (New) The system of claim 55, further comprising a system element to cool the mixture to reach a temperature below about 200°F.

61. (New) The system of claim 55, further including a system element to extrude the mixture.

62. (New) The system of claim 61, wherein heat is applied heat to the mixture while the mixture is in the system element to extrude the mixture.

63. (New) The system of claim 55, wherein the target nutritional values include crude protein, total amino acids, fat fiber, minerals, a ruminant animal bypass protein (RUP/UIP) range, amino acids in the RUP/UIP and post ruminal digestibility of the RUP/UIP, and the nutrients and nutrient amounts to be added that may be added are of different RUP/UIP amino acid levels, known crude protein, total amino acid, fat, fiber mineral and energy levels.

64. (New) A feed or feed supplement made by the method of claim 37.

65. (New) A feed or feed supplement made by the method of claim 42.

66. (New) A method of enhancing the nutrient value of distillers solubles, comprising:

adding one or more predetermined crude protein and/or amino acid content nutrient sources into the distillers solubles to create a distillation solubles by-product-nutrient source mixture;

determining desired nutrient levels of the distillation solubles; and changing at least one of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the by-product nutrient source mixture to the determined nutrient levels by changing the temperature of the by-product-nutrient source mixture.

67. (New) A method of producing an improved distillers solubles by-product, comprising:

establishing target nutritional values for a nutritionally enhanced distillers solubles by-product;

determining one or more nutrients and nutrient amounts to be added to the by-product to achieve nutritionally enhanced distillers, brewers or fermenters grain by-product that have at least one of different RUP/UIP, different RUP/UIP amino acid levels, different known crude protein, different total amino acid, different fat, and different fiber mineral and energy levels to achieve a nutritionally enhanced distillers, brewers or fermenters grain by-product than that which meet the established target nutritional values;

mixing the determined amounts of one or more nutrients with the distillers solubles to be added; and

heating the mixture of distillers solubles and nutrients to achieve a by-product temperature between from about 180°F to about 250°F to increase at least one of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the mixture to meet the established target nutritional values.

68. (New) A system for enhancing the nutrient value of distillers solubles, comprising:

an system element to inject one or more predetermined crude protein and/or amino acid level containing nutrient sources into the distillers solubles creating process to create an enhanced by-product-nutrient source mixture; and

a heater to apply heat to raise the temperature of and dry the by-product-nutrient source mixture to change the ruminant animal bypass protein of the by-product nutrient source mixture to predetermined levels.

69. (New) A system to produce an improved distillers solubles by-product, comprising:

a means to establish target nutritional values for a nutritionally enhanced distillers solubles by-product;

a means to determine one or more crude protein and/or amino acid containing nutrients and nutrient amounts to be added to the distillers solubles by-product that have a different RUP/UIP to achieve nutritionally enhanced distillers, brewers, or fermenters grain by-product than will meet the pre-established target nutritional values after processing.

a means to mix the determined amounts of nutrients with the distillers solubles; and

a means to heat and dry the mixture of distillers solubles and nutrients to achieve a by-product temperature between from about 180°F to about 250°F to change the bypass protein (RUP/UIP) level, amino acid levels in

the RUP/UIP and the post ruminal digestibility of the mixture to meet the pre established target nutritional values.

70. (New) The method of claim 42 wherein all three of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the mixture are changed.

71. (New) A method of enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

adding one or more predetermined crude protein and/or amino acid containing nutrient sources into the wet end of distillation or fermentation byproducts after at least one of fermentation and/or distillation to create a distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutritional value;

predetermining a desired level of at least one of bypass protein (RUP/UIP), amino acid levels in the RUP/UIP and the post ruminal digestibility of the nutrient source mixture; and

changing at least one of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the by-product nutrient source mixture to the predetermined level by changing the temperature of the by-product-nutrient source mixture.

72. (New) A method of predictably controlling the amount of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal

digestibility of the mixture to meet the pre established target nutritional values set forth in the last step of claim 55, comprising:

maintaining the drying temperature of the mixture at about 218 degrees Fahrenheit until mixture has about a 12% moisture content.

73. (New) A method of enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

adding one or more predetermined crude protein and/or amino acid containing nutrients into the wet end of distillation or fermentation byproducts after at least one of fermentation and/or distillation to create a distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutritional value;

predetermining a bypass protein level, an amino acid level in the RUP/UIP and a post ruminal digestibility level; and

changing the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the by-product nutrient source mixture to the predetermined level by changing the temperature of the by-product-nutrient source mixture.

74. (New) A method of enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

- adding one or more predetermined nutrient sources as nutrients into the wet end of distillation or fermentation byproducts after at least one of fermentation and/or distillation to create a distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutritional value;
- predetermining an amino acid level in the RUP/UIP and a post ruminal digestibility level; and
- changing the amino acid levels in the RUP/UIP and the post ruminal digestibility of the by-product nutrient source mixture to the predetermined level by changing the temperature of the by-product-nutrient source mixture.

75. (New) A method of enhancing the nutrient value of distillers, brewers or fermenters grain byproducts, comprising:

- adding one or more predetermined nutrient sources as nutrients into the wet end of distillation or fermentation byproducts after at least one of fermentation and/or distillation to create a distillation and/or fermentation by-product-nutrient source mixture having an enhanced nutritional value;
- predetermining a bypass protein level and an amino acid level in the RUP/UIP; and

changing the bypass protein (RUP/UIP) level and amino acid levels in the RUP/UIP of the by-product nutrient source mixture to the predetermined level(s) by changing the temperature of the by-product-nutrient source mixture.

76. (New) The method of claim 37, wherein the temperature is in a range that causes denaturation of the mixture.

77. (New) The method of claim 42, wherein the temperature is in a range that causes denaturation of the mixture.

78. (New) The system of claim 55, wherein the temperature is in a range that causes denaturation of the mixture.

79. (New) The system of claim 68, wherein the temperature is in a range that causes denaturation of the mixture.

80. (New) A method of producing an improved distillers, brewers or fermenters grain by-product, comprising:

establishing desirable nutritional values, including RUP/UIP levels and/or RUP/UIP amino acid levels for a nutritionally enhanced distillers, brewers or fermenters grain by-product;

determining nutrients and nutrient amounts to be added to the by-product to achieve one or more nutritionally enhanced distillers, brewers or fermenters grain by-products that have at least one of different RUP/UIP and

different RUP/UIP amino acid levels, than the established desirable values thereof;

mixing determined amounts of nutrients with wet distillers, brewers or fermenters grain; and

heating the mixture of wet distillers grains and nutrients to achieve a by-product temperature between from about 180°F to about 250°F to change at least one of the bypass protein (RUP/UIP) level, amino acid levels in the RUP/UIP and the post ruminal digestibility of the mixture to achieve a mixture having the established desirable nutritional values.

81. (New) The method of claim 37, wherein enhanced nutrient(s) comprise the group consisting of: (1) rumen degradable protein in the distillers, brewers and/or fermenters grains; (2) rumen degradable protein in the end by-product; (3) rumen degradable protein in the end by-product; (4) amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (5) ratios of amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (6) post rumen digestibility of the rumen undegradable protein; (7) fat levels in the end product; (8) fiber levels in the end by-product; (9) mineral levels in the end by-product; (10) vitamin levels in the end by-product; (11) pH of the end by-product; and (12) moisture levels in the end by-product.

82. (New) The system of claim 55, wherein enhanced nutrient(s) comprise the group consisting of: (1) rumen degradable protein in the distillers, brewers and/or fermenters grains; (2) rumen degradable protein in the end by-product; (3) rumen degradable protein in the end by-product; (4) amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (5) ratios of amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (6) post rumen digestibility of the rumen undegradable protein; (7) fat levels in the end product; (8) fiber levels in the end by-product; (9) mineral levels in the end by-product; (10) vitamin levels in the end by-product; (11) pH of the end by-product; and (12) moisture levels in the end by-product.

83. (New) The system of claim 69, wherein enhanced nutrient(s) comprise the group consisting of: (1) rumen degradable protein in the distillers, brewers and/or fermenters grains; (2) rumen degradable protein in the end by-product; (3) rumen degradable protein in the end by-product; (4) amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (5) ratios of amino acids in the rumen degradable protein and/or in the rumen undegradable protein; (6) post rumen digestibility of the rumen undegradable protein; (7) fat levels in the end product; (8) fiber levels in the end by-product; (9) mineral levels in the end by-product; (10)

vitamin levels in the end by-product; (11) pH of the end by-product; and (12) moisture levels in the end by-product.